Nematology Circular No. 138
February 1987

Fla. Dept. Agric. & Consumer Serv.
Division of Plant Industry

ENVIRONMENTAL COMPLEX: I. NEMATODES AND LOW TEMPERATURES.

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A combination of phytoparasitic nematodes and environmental stress conditions, such as cold, heat, excess water or drought, may result in a complex wherein the exposed plant or plants may be severely weakened, damaged, or actually killed. The simultaneous occurrence of nematodes and a stress condition can be more damaging than the presence of either the nematodes or stress condition alone.

The objective of this circular is to present an example of an environmental complex involving ***Gardenia jasminoides*** Ellis, root-knot nematode (***Meloidogyne incognita*** (Kofoid & White, 1919) Chitwood 1949) and low temperature. Prior to 1962, many gardenia plants in North Florida were produced in nursery operations by setting gardenia cuttings in unfumigated field rooting beds (Fig. 1) usually in December or January. After about 10 months, the rooted cuttings are transplanted to rows in unfumigated field sites. The plants remain in the field until an April or May harvest the following year. Unfortunately, the rooting beds were often infested with root-knot nematodes, and, as a result, many of the transplanted cuttings were infected with the pest when transplanted to field sites. To reduce disease problems, cuttings were rooted in nematode-free builder's sand on slathouse benches (Fig. 2), instead of in field beds. After about 3 months, rooted cuttings are placed in methyl bromide treated soil in 5 cm (2 1/2 inch) pots, and about 5 months later the plants are ready to transplant in the field.

In January 1962, two separate field plantings of gardenias, one using the old propagating method and transplanted into a field infested with root-knot nematodes from a previous crop, and one using the new propagating system planted in a field that had been out of crop production for several years, were planted relatively close to each other. Soil samples were taken in May 1962 from the field where the nematode free cuttings (Fig. 4) were planted; no root-knot nematodes were detected. On December 11 and 13-15 of that year temperatures of -4, -12, -7 and -6 degrees C (25, 10, 19, and 22 degrees F) respectively were recorded in the area. These freezes produced extensive losses to fruit trees and plant growth in many parts of Florida, particularly to citrus.

At harvest (April and May, 1963) the root-knot infected gardenias were so severely damaged (Fig. 3) that they were either killed or required extensive pruning (Fig. 5). Gardenias in a field free of root-knot nematodes, by contrast, were vigorous and healthy (1) (Fig. 4) .

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Fig 1. Gardenias in a non-fumigated field rooting bed.

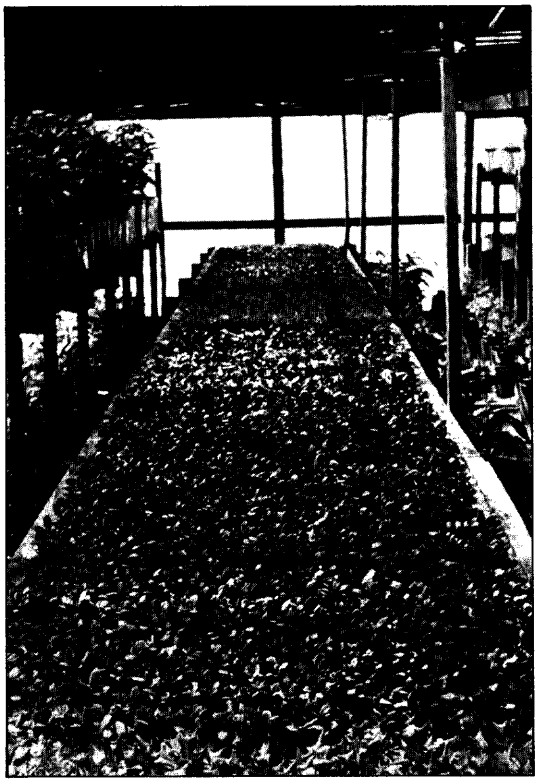

Fig. 2. Gardenias in builder's sand in a slathouse bench rooting bed.

Fig. 3. Seventeen month old gardenias. Left: root-knot nematode free healthy plant not affected by freeze. Right: Root-knot nematode infected freeze damaged plant.

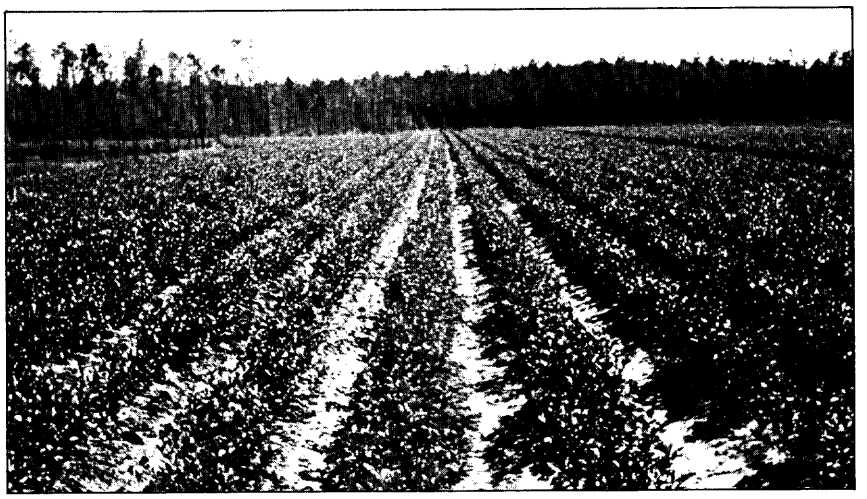

Fig. 4. A field planting of 17 month old healthy root-knot free gardenias.

Fig. 5. A field planting of 17 month old freeze damaged root-knot infected gardenias.

Discussion: Other studies have demonstrated similar responses to environmental complexes involving nematodes and low temperature. In cold hardiness studies twigs from cherry trees grown in fumigated plots were found to be more cold resistant during the dormant season than twigs from trees grown in nontreated soil. After a severe cold period in January, many more buds were killed in trees from the nonfumigated plots (2). Cotton seedlings infected with pathogenic fungi and root-knot nematodes were tested over a range of temperatures. Damage to infected seedlings was greatest at cooler temperatures (4) compared to noninfected seedlings. In tests involving onions and ***Pratylenchus penetrans*** (Cobb, 1917) Filipjev and Schuurmans Stekhoven, 1941, it was postulated that "soil temperature has a marked influence on the ability of this lesion nematode to cause injury to onions" (3).

Onions growing at low soil temperatures (7-13 degrees C) may be severely injured by low populations of ***P. penetrans***, whereas at higher soil temperatures (16-25 C) many more lesion nematodes may be present without injuring the onion plant.

Survey and Detection: Following a plant damaging freeze, examine dead and dying plants for evidence of nematode injury.

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Contribution No. 320, Bureau of Nematology

This publication was issued at a cost of $941.44 or .27 per copy to provide information on proper recognition of plant pests. PI87T-08